Geometric Design
Strategic Research Program

Joint Meeting of TRB Committees on Geometric Design and Operational Effects of Geometrics
and
AASHTO Technical Committee on Geometric Design

Irvine, CA
July 26, 2011

Presented by Eric Donnell and Brian Ray
Background

- **TRB Research Topic Development**
  - Had been random; “hot topics”
- **Collaboration with AASHTO**
  - Santa Fe and Williamsburg (TRB in Woods Hole)
- **Strategic Geometric Design Research Program**
  - Prioritized and sequential research
  - Opportunities to consider emerging topics
- **A new range of opportunities**
  - Lessons from Green Book update
  - New AASHTO technical committee chair and members
  - Update strategic research plan (E-C110)
Presentation Overview

- TRB Research Topic Development Timeline
  - Origins and schedule
- Strategic Geometric Design Research Program
  - Content
  - Funded projects
- Purpose of Mid-year Meeting
  - Breakout sessions
  - General sessions
  - Post-meeting action items
But First...Some Background

*Purpose of TRB Committees:*

- Expanding the body of knowledge regarding highway and street geometric design elements that affect safe and efficient operations for all users.
- Developing research needs statements and communicating findings that advance geometric design criteria, guidance, methods, and performance-based design objectives.
- Facilitating domestic and international dialogues and idea exchanges while supporting emerging and developing professionals.
Geometric Design Committee Structure

- **Research Sub Committee**
  - Coordinate and manage the strategic research plan
  - Produce and prioritize research needs statement

- **Business Sub Committee**
  - Execute recurring and ad-hoc committee business
  - Integrate and mentor AFB10's membership
  - Conduct outreach to external sources in support of committee business
  - Coordinate special assignments and forums as they arise

- **Liaison Activities Working Group**
  - Focus on the technical Geometric design elements of leading to the 202X vision
  - Strategic research program
  - Conduct committee activities that lead to exploration of technical issues and priorities

- **Technical Sub Committee**
  - Focus on the technical Geometric design elements of leading to the 202X vision
  - Strategic research program
  - Conduct committee activities that lead to exploration of technical issues and priorities

- **Refined Research Plan**
- **Assess Current Plan**
- **Obtain Input from Others**
- **Identify Early Research Problem Needs**
- **Identify Next Steps**
Research Topic Development Timeline

- TRB Committees originate research needs statements (RNS) at annual or mid-year meetings
- AASHTO Standing Committee on Research (SCOR) solicits RNS in July
- AASHTO Members, AASHTO Committees and FHWA Submit Research Needs by September
- TRB solicits panel nominations in May
- SCOR provides research results to AASHTO in March-April
- SCOR/RAC Ballots open December-February

Annual NCHRP Projects Announced

TRB issues requests for proposals and selects research contractors in July - December
Strategic Geometric Design Research Program

Brainstorm Research Needs
Santa Fe, NM
2002

Form Steering Committee
Plan Geometric Design Research Needs Workshop
2002 - 2004

Prepare 7 White Papers
2003 - 2004

Form Methodology, Highways, Freeway/Interchanges, & Streets/Intersections Technical Groups to update plan
January 2009

Prepare 22 Research Needs Statements
TRB E-circular E-110
January 2007

TRB Mid-year Meeting
Research Needs Planning/Updates
Woods Hole, MA
July 2009

Prepare Updated Research Needs Document
2011-2012

TRB Committees on Geometric Design (AFB10) & Operational Effects of Geometrics (AHB65) & AASHTO Technical Committee on Geometric Design
Current Research Needs Documentation

- Transportation E-Circular (E-C110)

- 22 research needs statements

- Result of 2004 mid-year meeting
  - Joint effort of AASHTO Technical Committee and TRB Committees on Geometric Design and Operational Effects of Geometrics

<table>
<thead>
<tr>
<th>No.</th>
<th>Problem Statement Title</th>
<th>Project No.</th>
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<th>End Date</th>
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<tr>
<td>1</td>
<td>Median Design and Barrier Issues in Urban and Rural Environments</td>
<td>NCHRP 22-21</td>
<td>Jan. 2006</td>
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<td>Investigation of Alternative Geometric Highway Design Processes</td>
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<td>Right-turn Interactions and Channelized Right-turns</td>
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<td>NCHRP 3-88</td>
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<td>Safety and Operational Tradeoffs of and Shoulder Widths</td>
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<td>Safety, Operations, and Usability Tradeoffs of Road User Groups</td>
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<td>Safety and Operational Impacts of Four-and Six-Lane Cross-sections with Raised versus Two-way Left-turn Lanes</td>
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<td>Superelevation Criteria for Steep Grades on Horizontal Curves</td>
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<td>Effectiveness of Mid-block Crossing Treatments</td>
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<td>Intersection Design to Accommodate Pedestrian Crosswalk Cross Slopes</td>
<td>NCHRP 15-42</td>
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<td>Guidelines for Provision of Sidewalks</td>
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<td>Safety Effects of Intersection Skew Angle</td>
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<td>Accommodating Bicyclists on Rural Highways</td>
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**Other Funded Projects**

Placement of Traffic Barriers on Roadside and Median Slopes

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Funded Synthesis Statements

- Topic 40-07: Trade-off Considerations in Highway Geometric Design (active)

- Topic 40-08: Effective Speed Reduction Techniques for Rural High to Low Speed Transitions (Synthesis 412)

- Topic 41-01: Geometric Design Practices for Resurfacing, Restoration, and Rehabilitation (Synthesis 417)
Recent Updates to Strategic Research Program

- Form four technical subgroups:
  - Methodology
  - Highways
  - Freeways and Interchanges
  - Streets and Intersections
- Review and update existing white papers
- Review and update unfunded research needs statements
- Identify emerging topics
- Prepare new research needs statements
### Updated Research Program

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<td>Developing Design Criteria for Cost-effective Multi-lane Loop Ramp Design</td>
<td>NCHRP 3-105</td>
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<td>Safety Evaluation of 13 Controlling Criteria for Design</td>
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<td>Auxiliary Turn Lane Design Guidance and Policy Upgrades</td>
<td>NCHRP 3-102</td>
<td>Aug. 2011</td>
<td>July 2012</td>
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<td>Integrated Ramp and Ramp Terminal Design</td>
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<td>Study of Vehicle Paths on Horizontal Transition Curves</td>
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<td>An Assessment of Geometric Design Policies and Processes</td>
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<td>7</td>
<td>Intersection Sight Distance and Safety</td>
<td>NCHRP 17-59</td>
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<td>Decision Sight Distance</td>
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<td>Applying Geometric Design Criteria within The Intermediate Speed Range</td>
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<td>Forgiving Roadway Design</td>
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<td>Development of a Bicycle Safety Prediction Methodology</td>
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<td>Effective Allocation of Available Freeway Travel Lane and Shoulder Widths</td>
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<td>Impacts and Implementation of Skew Angles</td>
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<td>Intersection Design and Evaluation Resource</td>
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<td>Comprehensive roadway design (complete streets)</td>
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<td>Speed Prediction Models for Multilane Rural/Suburban Highways</td>
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<td>Speed Prediction Models for Trucks</td>
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<td>Lighting-Safety-Geometric Design Feature</td>
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Synthesis Topics (2010)

- Design and Maintenance of Traffic During Construction
- Curve and Cross-section Design on Temporary Facilities
- Truck Facility Design (marshaling yards, truck-only ramps)
- Highway Design to Support Traffic Enforcement
- Geometric Issues to Remove Fixed-barrier Toll Plazas for Conversion to Open-road Tolling/All Electronic Toll Collection
- Current Practices for Provision of Sidewalks
- Geometric Design of Pavement Profiles through Intersections
- Crosswalk Cross-slope Design Practices
Synthesis Topics (2011)

- Permanent Glare Screen Design Guidance
- Safety and Operational Treatments to Reduce Pedestrian/Motor vehicle Crashes at Roadway Crossings
- Practices for Incorporating Historical Data and Performance Analysis into Reconstruction Project Decisions
- Performance-based Analysis Tools: Practical Applications
- Methods for Prioritizing Geometric Upgrades on Low-volume Roads
- Human Factors and Driver Performance Research at Night with Impact on Geometric Design Criteria
Purpose of 2011 Mid-year Meeting

- Presentation of NCHRP projects from Strategic Research Plan (generate research ideas)
- White Papers
- Unfunded Research Needs
- Emerging Research Needs
- Documentation of Updated Strategic Research Plan
Presenting an overview of NCHRP Projects:

- Ramp and Interchange Spacing
- Design Guidance for Channelized Right-turn Lanes
- Median Cross-section Design for Rural Divided Highways
- Superelevation Criteria for Sharp Horizontal Curves on Steep Grades
- Design Guidance for High-Speed to Low-Speed Transition Zones for Rural Highways
- Recommended Bicycle Lane Widths for Various Roadway Characteristics
Review White Paper

- Review one of the following:
  - Design Controls/Methodology
  - Freeways and Interchanges
  - Highways
  - Streets and Intersections

- Sign-up to participate in breakout session in relation to the white paper you reviewed
Review Unfunded Research Needs

- Review unfunded research needs related to white paper
  - Is the topic still relevant?
  - Does research need have broad impact (i.e., is need related to a regional or national geometric design issue)?
Attend Breakout Session(s)

- Organized by white paper topics
  - Discuss white paper themes
  - Discuss unfunded research needs
  - Discuss “emerging” research topics
    - Objective
    - Scope of work
    - Funding
    - Period of performance
  - Confirm that all related topics discussed during general session are discussed

- Build consensus on 3-6 (or more) research needs
  - Recall: NCHRP project are ~$200,000 to $800,000 over 18 to 36 month period; NCHRP synthesis projects are $40,000 over 12 months
Breakout Facilitators

- **Design Controls/Methodology**
  - Michael Dimaiuta
  - Douglas Harwood

- **Freeways and Interchanges**
  - Richard Coakley
  - Mark Doctor

- **Highways**
  - James Brewer
  - Eric Donnell

- **Streets and Intersections**
  - Marcus Brewer
  - Brian Walsh
Breakout Recorders

- Design Controls/Methodology
  - Hillary Isebrands
- Freeways and Interchanges
  - John Smart
- Highways
  - Pete Jenior
- Streets and Intersections
  - Jason Simmers
Action Items and Outreach

- Prepare updated Strategic Research Needs Program after mid-year meeting
- Coordination with AASHTO
  - Provide input and support on existing and new research needs statements and synthesis topics
  - Share ideas on Green Book revision and other research needs
Thank You!

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E-mail: bray@kittelson.com